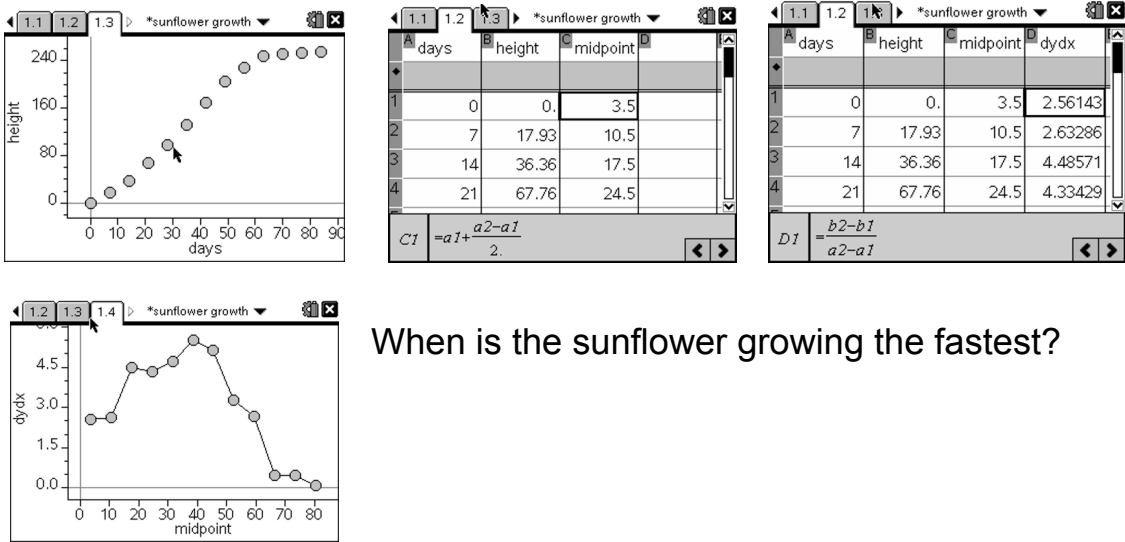


3.1b Derivative as a function - numerically and algebraically

Sunflower growth




When is the sunflower growing the fastest?

Sep 9-10:16 PM

1.1 1.2 1.3 Robonaut 2 ...ons

NASA's Math And Science @ Work

**Robonaut**



AP Calculus

1.6 1.7 1.8 Robonaut 2 ...ons

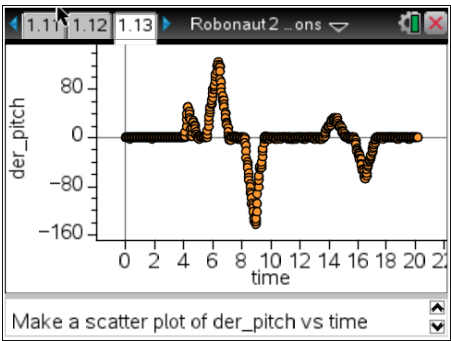
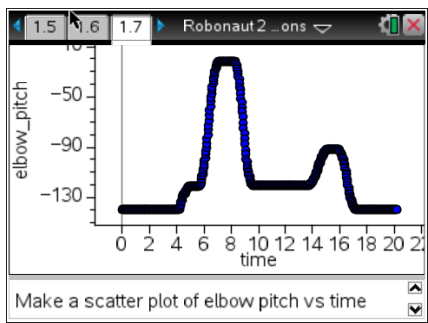
Estimate the rate of change of the pitch at 6 seconds.

Student: Type response here.

-103.4172668--107.8077393 69.8475

6.034368-5.97151

1/99



Sep 13-10:33 AM

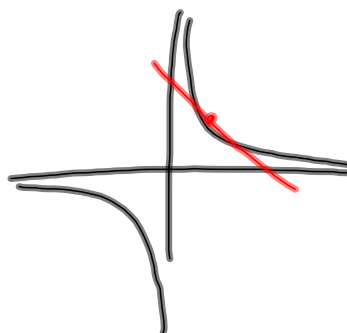
Find the derivative of  $y = 1/x$  at  $x=1$

$$\lim_{h \rightarrow 0} \frac{f(a+h) - f(a)}{h}$$

$$\lim_{h \rightarrow 0} \frac{f(1+h) - f(1)}{h}$$

$$\lim_{h \rightarrow 0} \frac{\frac{1}{1+h} - \frac{1}{1}}{h} = \lim_{h \rightarrow 0} \frac{\frac{1 - (1+h)}{1+h}}{h}$$

$$\lim_{h \rightarrow 0} \frac{\frac{-h}{1+h}}{h} = \lim_{h \rightarrow 0} \frac{-h}{1+h} \cdot \frac{1}{h} = -1$$



Sep 9-10:41 PM

Find the derivative of  $y = \sqrt{x+2}$  at  $x=7$

$$\lim_{h \rightarrow 0} \frac{f(7+h) - f(7)}{h}$$

$$\lim_{h \rightarrow 0} \frac{(\sqrt{9+h} - 3)(\sqrt{9+h} + 3)}{h(\sqrt{9+h} + 3)}$$

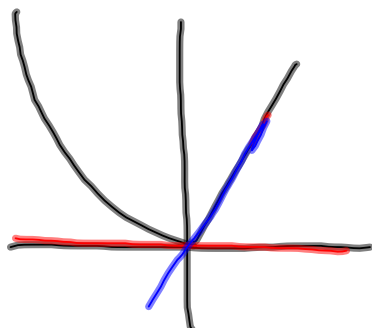
inner & outer cancel

$$\lim_{h \rightarrow 0} \frac{9+h-9}{h(\sqrt{9+h} + 3)} = \lim_{h \rightarrow 0} \frac{1}{\sqrt{9+h} + 3} = \frac{1}{6}$$

Sep 10-11:27 AM

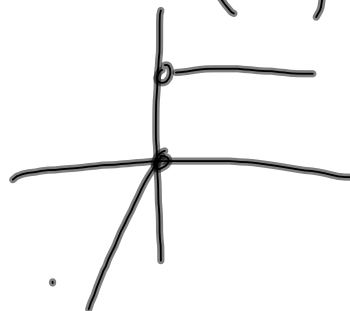
## One-sided derivatives

Show that the following function has a left hand and a right hand derivative at  $x=0$ , but no derivative there.



$$f(x) = \begin{cases} x^2 & x \leq 0 \\ 2x & x > 0 \end{cases}$$

$$f'(x) = \begin{cases} 2x, & x \leq 0 \\ 2, & x > 0 \end{cases}$$



Sep 10-11:33 AM